l LISTING OF CLAIMS

2 What is claimed is:

3 1. (Currently amended) A method for imparting a watermark onto a digitized image, said
4 method comprising:

5 providing a digitized image having at least one image plane, said image plane being
5 represented by an image array having a plurality of pixels, each pixel in said plurality of pixels pixel
7 having at least one color component, said watermark being formed using a distinct watermarking
3 plane represented by an array having a plurality of distinct watermarking elements, each of said
9 distinct watermarking elements having an array position and having one-to-one positional
) correspondence with said image pixels, and

l multiplying said brightness data associated with said at least one color component by a
2 predetermined brightness multiplying factor, wherein said brightness multiplying factor is a
3 corresponding distinct watermarking element, and said watermark has a invisibility classification.

4 2. (Original) A method as recited in claim 1, wherein said brightness multiplying factor has a
5 relationship with a number taken from a random number sequence.

5 3. (Original) A method as recited in claim 2, wherein said relationship is a linear remapping to
7 provide a desired modulation strength.

3 4. (Original) A method as recited in claim 3, wherein said modulation strength lies in the
9 domain greater than or equal to zero and less than or equal to 0.5.

) 5. (Original) A method for imparting a watermark onto a digitized image comprising the steps
l of:

Serial No.: 09/931,210

YOR919960153US4   3/37

1   providing said digitized image comprised of a plurality of pixels, wherein each of said pixels

2 includes brightness data that represents a brightness of at least one color; and

3   altering said brightness data associated with a plurality of said pixels maintaining the hue and

4 saturation of said pixel.

5 6.   (Original) A method as recited in claim 5, wherein said image has I rows and J columns, and

6 has a pixel in row i and column j having at least one brightness, $Y(i,j)$, and the step of altering

7 includes:

8 adding to or subtracting from the brightness $Y(i,j)$ a different small random value $e(i,j)$, wherein $1 \leq$

9 $i \leq I$ and $1 \leq j \leq J$ are the row and column indices of a pixel location in the image.

10 7.   (Original) A method as recited in claim 6, wherein the step of adding to or subtracting from

11 includes making $e(i,j)$ proportional to an original brightness of the pixel.

12 8.   (Original) A method as recited in claim 6, wherein color components of the unaltered pixel

13 are $X(i,j)$, $Y(i,j)$, and $Z(i,j)$, and color components of the brightness altered pixel are $X'(i,j)$, $Y'(i,j)$,

14 and $Z'(i,j)$, and the step of adding to or subtracting from includes setting $e(i,j) = d(i,j)Y(i,j)$, where

15 $d(i,j)$ is a value selected from an array of random values within a range of $0 <= d(i,j) <= 1$, such that

16 the modified brightness $Y'(i,j) = Y(i,j)+e(i,j) = Y(i,j)+d(i,j)Y(i,j)$, and $X'(i,j)/X(i,j) = Z'(i,j)/Z(i,j) =$

17 $Y'(i,j)/Y(i,j) = e(i,j) = 1-d(i,j)$.

18 9.   (Original) A method as recited in claim 8, wherein the step of setting includes preserving

19 ratios of color components in each pixel.

20 10.   (Original) A method as recited in claim 9, wherein the step of preserving includes setting

21 $X'(i,j)/X(i,j) = Z'(i,j)/Z(i,j) = Y'(i,j)/Y(i,j) = 1-d(i,j)$, wherein the color components of the unaltered

22 pixel are $X(i,j)$, $Y(i,j)$, and $Z(i,j)$, and the color components of the brightness altered pixel are $X'(i,j)$,

23 $Y'(i,j)$, and $Z'(i,j)$.

Serial No.: 09/931,210

YOR919960153US4 4/37

1 11. (canceled)

2 12. (currently amended) A method ~~as recited in claim 11,~~ for imparting a watermark onto a digitized
3 image comprising the steps of:

4 providing said digitized image comprised of a plurality of pixels, wherein each of said pixels
5 includes brightness data that represents a brightness of at least one color, with said image
6 having I rows and J columns, and a pixel in row i and column j having a brightness Y(i,j);
7 and

8 for a plurality i and at least one j adding to or subtracting from the brightness Y(i,j) a random
9 value e(i,j), wherein 1 [i [I and 1 [j [J are the row and column indices of a pixel location in
10 the image.
11 wherein e(i,j) is in the domain 0 to 1 multiplied by Y(i,j).

12 13. (Original) A method for generating a watermarked image, the method comprising:

13 imparting a watermark onto a digitized image having a plurality of original pixels, each of said pixels
14 having at least one original pixel brightness value;

15 providing said digitized watermarking plane comprising a plurality of watermarking
16 elements, each element having a watermark brightness multiplying factor and having one-to-one
17 positional correspondence with said original pixels; and

18 producing a watermarked image by multiplying said original brightness of each of said
19 original pixels by said brightness multiplying factor of a corresponding one of said watermark
20 elements.

21 14. (Original) A method comprising:

22 forming a watermarking plane including a plurality of elements each having a brightness adding or

Serial No.: 09/931,210

1   subtracting factor, including the steps of:

2   generating a secure random sequence of integers having a first plurality of bits;

3   linearly remapping said random sequence to form a remapped sequence of brightness
4   multiplying factors to provide a desired modulation strength;

5   computing a discrete Fourier transform of said remapped sequence to form a Fourier
6   sequence having frequency coordinates;

7   expanding said frequency coordinates to form an expanded sequence;

8   computing an inverse discrete Fourier transform of said expanded sequence to obtain a
9   watermarking sequence of values; and

10   deriving said brightness adding or subtracting values of said elements of said watermarking
11   plane based upon said watermarking sequence of values.

12   15. (Currently Amended) A method for detecting a watermark in a marked image, said method
13   comprising:

14   providing said marked image marked by a watermarking plane, said marked image having at least
15   one color plane including a plurality of image pixels, said watermarking plane having a plurality of
16   watermarking elements, wherein each of said image pixels has at least one brightness value and each
17   of said watermarking elements has a brightness adding and/or subtracting factor, including the steps
18   of:

19   (a) reconstructing said watermarking plane;

20   (b) aligning said watermarking plane with said marked image such that each watermarking
21   element has a corresponding image pixel;

Serial No.: 09/931,210

YOR919960153US4   6/37

1   (c) providing a selector array and a visualizer image of equal size, wherein said selector array

2   has a plurality of selector elements each having at least one counter, and wherein said visualizer

3   image has a plurality of visualizer pixels each having at least one brightness value, and wherein said

4   visualizer pixels represent a recognizable pattern when displayed;

5   (d) resetting said at least one counter to zero;

6   (e) placing said selector in an initial position by aligning said selector elements with a

7   plurality of corresponding image pixels and a plurality of corresponding watermarking elements;

8   (f) choosing a selector element and identifying a corresponding watermarking element;

9   (g) identifying a first plurality of watermarking elements that neighbor said corresponding

10   watermarking element;

1   (h) generating a first average that represents an average of brightness ~~multiplying~~ adding

2   and/or subtracting factors of said first plurality of watermarking elements;

3   (i) choosing a color plane of said marked image and finding a corresponding image pixel;

4   (j) identifying a first plurality of neighboring pixels that neighbor said corresponding image

5   pixel;

6

7   (k) generating a second average that represents an average of brightness values of said first

8   plurality of neighboring pixels;

9   (l) updating said at least one counter based upon first and second comparison operations,

10   wherein said first comparison operation compares said first average with said brightness <u>adding</u>

11   <u>and/or subtracting</u> ~~multiplying~~ factor of said corresponding watermarking element and said second

12   comparison operation compares said second average with said brightness value of said corresponding

Serial No.: 09/931,210

YOR919960153US4   7/37

1   pixel;

2   (m) repeating steps (i) through (l) for all color planes;

3   (n) repeating steps (f) through (m) for all selector elements;

4   (o) choosing a new selector position that does not overlap any previous selector position;

5   (p) repeating steps (f) through (o) for all non-overlapping selector positions; and

6   (q) generating a visual representation indicating detection of said watermark in said marked
7   image utilizing said at least one counter of said selector array and said visualizer pixels.

8   16.   (Original) A method for detecting a watermarking plane comprising the steps of:

9   providing an image having a plurality of image pixels, $u(i,j)$, with said image having I rows
10   and J columns, and a pixel in row i and column j having at least one component, marked by a
11   watermarking plane; said watermarking plane having a plurality of watermarking elements, $w(i,j)$,
12   with said watermarking plane having I rows and J columns, and an element in row i and column j
13   having a brightness multiplying factor;
14   aligning said watermarking plane with said image;

15   identifying a subset of said image elements;

16   for each pixel, $u(i,j)$, of said subset of image pixels,

17   generating a first value representing a relationship between an attribute of said pixel
18   $u(i,j)$ and an attribute of image pixels that neighbor said pixel $u(i,j)$;

19   1   identifying a watermarking element, $w(i,j)$, that corresponds to said pixel $u(i,j)$ and
20   watermarking elements that correspond to said image pixels that neighbor said image pixel $u(i,j)$;

Serial No.: 09/931,210

1   generating a second value representing a relationship between an attribute of said

2   watermarking element w(i,j) and an attribute of the identified watermarking elements; and

3   generating a coincidence value representing a likelihood that said image is marked by

4   said watermarking plane based upon said first and second values.

5   17.   (Original) A method as recited in claim 1, wherein said distinct watermarking element, has a

6   value being in the domain greater than or equal to zero and less than or equal to one.

7   18. (Original) A method for imparting a watermark onto a digitized image comprising the steps of:

8   providing said digitized image comprised of a plurality of image pixels with said digitized

9   image having I rows and J columns, and a pixel in row i and column j having at least one component,

10 Y(i,j); and

1   adding to or subtracting from said brightness data associated with at least one of said pixels a

2   predetermined brightness adding factor in the range of 0 to Y(i,j), or brightness subtracting factor in

3   the range of 0 to Y(i,j).

4   wherein said brightness adding or subtracting factor has a relationship with a number taken from a

5   random number sequence, said relationship is a linear remapping to provide a desired modulation

6   strength, and said modulation strength is less than or equal to 50 percent.

7   19. (Original) A method for imparting a watermark onto a digitized image comprising the steps of:

8   providing said digitized image comprised of a plurality of image pixels with said image

9   having I rows and J columns, and a pixel in row i and column j having at least one component,

10 Y(i,j); and

1   adding to or subtracting from said brightness data associated with at least one of said pixels

Serial No.: 09/931,210

1 by a predetermined brightness adding or subtracting factor in the range of 0 to Y(i,j),

2 wherein said brightness adding or subtracting factor has a relationship with a number taken from a
3 random number sequence, said relationship is a linear remapping to provide a desired modulation
4 strength, said sequence is formed from a plurality of robust watermarking parameters, and said
5 parameters comprise a cryptographic key, two coefficients and an initial value of said random
5 number generator.

7 20.   (Original) A method for detecting a watermark, said method comprising:

3 providing a marked image having a plurality of image pixels said marked image being marked by a
) watermarking plane, having a plurality of watermark elements;

) aligning said watermarking plane with said marked image, and

1 generating a coincidence value by averaging a detection coincidence for each selector element of a
2 group of selector elements taken from said image pixels.
3

4 21.   (Original) A method as recited in claim 20, wherein each of said group of selector elements
5 has a selector size, said method further comprising:

5 providing a visualizer pattern having a plurality of visualizer pixels and a visualizer size equal to said
7 selector size, each of said visualizer pixels being associated with one of said selector elements and
3 having a visualizer color; and

) displaying a watermark detection pattern having a size at least equal to said visualizer size and a
) plurality of visualizer-coincidence pixels, wherein each of said visualizer-coincidence pixels is
1 associated with a corresponding selector element and a corresponding visualizer pixel, and each of
2 said visualizer-coincidence pixels being displayed having said visualizer color when said
3 coincidence value of said corresponding selected element has an indication of a detection success
4 and having another color otherwise.

Serial No.: 09/931,210

1 22.   (Original) A method as recited in claim 20 wherein said watermark is based on a factor

2 multiplying a brightness value of each of said image pixels.

3 23.   (Original) A method as recited in claim 20, further comprising:

4 reconstructing said watermarking plane used in generating said watermark.

5

6 24.   (Original) A method as recited in claim 23, wherein said watermarking plane has a plurality

7 of watermarking elements, said method further comprising:

8 rotating, resizing and said image to bring it to a size and position of an original image, and

9 aligning said watermarking plane with said marked image such that each of said watermarking

10 elements has a corresponding image pixel.

1 25.   (Original) A method as recited in claim 20, wherein each said group contains 128 elements.

2 26.   (Original) A method as recited in claim 20, wherein each pixel of said image pixels has a

3 monochrome brightness value.

4 27.   (Original) A method as recited in claim 20, wherein said watermarking plane is generated

5 using a plurality of robust watermarking parameters.

6 28.   (Currently amended) A method as recited in claim 20, wherein said coincidence ~~variable~~

7 value is determined using a statistically related attribute relating each said selector element to a

8 plurality of neighboring elements.

9 29.   (Original) A method as recited in claim 28, wherein said attribute is a brightness value.

10

11 30.   (Original) A method for detecting a watermark imparted on an image, said method

Serial No.: 09/931,210

YOR919960153US4 11/37

1 comprising:

2 providing said image having at least one image plane, said image plane being represented by an
3 image array having a plurality of image elements, said watermark being formed using a
4 watermarking plane represented by a watermarking array having a plurality of watermarking
5 elements, each of said watermarking elements having a first array position and having one-to-one
5 positional correspondence with said image elements;

7 computing a first statistically related variable for each element of at least one first grouping of a first
3 selector array of elements taken from said image elements, wherein each of said image elements has
3 a second array position;

) computing a second statistically related variable for each element of at least one second grouping of
l a second selector array of elements taken from said watermarking elements, wherein each element of
2 said second selector array of elements has one-to-one positional correspondence with said first
3 selector array, and wherein said correspondence forms combinations of corresponding elements;

4 comparing to determine an affirmative and non-affirmative likeness of said first and second
5 statistically related variables for each of said combinations of corresponding elements; and

5 forming at least one comparison array having one-to-one correspondence with said at least one first
7 grouping and having a plurality of comparison elements, wherein each of said comparison elements
3 contains a positive detection indication for each element of said first grouping when said step of
) comparing results in an affirmative likeness, and a negative detection indication for each element of
) said first grouping when said step of comparing results in a non-affirmative likeness.

l 31. (Original) A method as recited in claim 30, wherein said watermark is formed by adding or
2 subtracting a brightness factor of each of said image elements by an amount contained in a
3 corresponding element of said watermarking elements.

l 32. (Original) A method as recited in claim 30, wherein said first grouping corresponds to a

Serial No.: 09/931,210

1   selector positioned to encompass said first selector array of elements forming a rectangular cluster of
2   elements.

3   33.   (Original) A method as recited in claim 30, wherein said first statistical variable is formed by
4   comparing an attribute of said each element of said first selector array of elements to an average
5   attribute of its 128 closest neighbors.

5   34.   (Currently amended) A method as recited in claim 33 30, wherein said attribute is a ratio of
7   the color component to the average of neighboring color components in the same color plane.

3   35.   (Original) A method as recited in claim 30, wherein each of said at least one first grouping is
7   positioned so as not to overlap any other of said at least one first grouping.
)

1   36.   (Original) A method as recited in claim 30, wherein each said comparison elements has a
2   particular position in said comparison array, said method further comprising:

3   determining an average percentage of said affirmative and non-affirmative likeness of each element
4   of said comparison elements having a same particular position in all arrays of said at least one
5   comparison array, and

5   forming a detection array of elements having one-to-one element correspondence with said
7   comparison elements, wherein each element of said detection array of elements contains said average
3   percentage.

)   37.   (Original) A method as recited in claim 36, further comprising the steps of:

)   providing a visualizer pattern of pixels represented by an array having visualizer pixels which have
1   one-to-one element correspondence with said detection array, each of said visualizer pixels has a first
2   logical value if a corresponding visualizer pixel is black, and a complementary logical value if said
3   corresponding pixel is white;

Serial No.: 09/931,210

1 forming a visualizer coincidence image having a plurality of coincidence pixels, wherein a
2 coincidence pixel has a corresponding visualizer pixel and a corresponding detection array element;
3 and

1 setting said coincidence pixel to black if both said corresponding visualizer pixel is black and said
5 percentage average of said corresponding detection array element has a value greater than a
5 predetermined detection threshold, otherwise setting said coincidence pixel to white.

7 38.   (Original) A method as recited in claim 30, wherein said image has three color planes.

3 39.   (Original) A method comprising generating a visual representation of a data array of data
9 elements having a data array size, including the steps of:

)   providing a visualizer pattern of visualizer pixels represented by a visualizer array of
1 visualizer pixels, said visualizer array having a visualizer array size equal to said data array size;

2   forming a visualizer-coincidence image of image pixels represented by an image array having
3 an image array size equal to said visualizer array size;

1   setting each said visualizer-coincidence pixel to the color of said corresponding visualizer
5 pixel if a value of said corresponding data element is above a predetermined threshold and to another
5 color if said value is below said predetermined threshold; and

7   displaying said visualizer-coincidence image to form said visual representation.

3 40. (Original) A method as recited in claim 39, wherein said data array represents data resulting from
9 a watermark detection implementation.

) 41. (Original) A method as recited in claim 39, wherein said first color is black and said second color
1 is white.

Serial No.: 09/931,210

1 42. (Original) A method as recited in claim 39, wherein said threshold is set at a fifty percent success

2 rate.

3 43. (Original) A method for demonstrating an existence of a watermark in a marked image, said

4 image having a plurality of image pixels, said method comprising:

5 providing a visualizer pattern represented by an array of visualizer elements, each of said visualizer

5 elements corresponding with one pixel of a plurality of visualizer pixels and having a first value if

7 said one pixel has a first color and a second value if said one pixel has a second color, said visualizer

3 array having a visualizer array size;

3 implementing a watermark detection scheme and computing a coincidence value for each of said

3 image pixels within a plurality of pixel selector arrays taken from among said image pixels, each of

1 said pixel selector arrays having a selector array size equal to said visualizer array size;

2

3 forming a detection array from a plurality of coincidence values, wherein said detection array has a

4 detection array size equal to said visualizer size; and

5 computing a coincidence detection value for each of said visualizer elements such that said detection

5 value represents a visualizer.

7 44. (Original) A method for detecting a watermark in a marked image having a plurality of image

3 pixels, said marked image marked by a watermarking plane having a plurality of watermarking

3 elements, said method comprising:

3 providing a visualizer pattern having a plurality of visualizer pixels and a visualizer size;

1 aligning said watermarking plane with said marked image such that each said image pixel has a

2 corresponding watermarking element;

3 generating a statistically related variable for each image element in a plurality of groupings of image

Serial No.: 09/931,210

YOR919960153US4   15/37

1   elements in relationship with said corresponding watermarking element; wherein each of said

2   groupings has a grouping size equal to said visualizer size;

3   averaging said variable for each element in a like position of all of said groupings to obtain a

4   composite detection success value; and

5   displaying detection success values by a plurality of visualizer-coincidence pixels having a size equal

5   to said visualizer size, each said visualizer-coincidence pixel having a same color as said

7   corresponding visualizer pixel when said corresponding success value indicates detection success

3   and another color otherwise.

3   45. (Previously presented) A computer program product comprising a computer usable medium

)   having computer readable program code means embodied therein for causing a watermark to be

1   imparted into an image, the computer readable program code means in said computer program

2   product comprising computer readable program code means for causing a computer to effect the

3   steps of:

4   providing a digitized image having at least one image plane, said image plane being

5   represented by an image array having a plurality of pixels, said pixel having at least one color

5   component, said watermark being formed using a distinct watermarking plane represented by

7   an array having a plurality of distinct watermarking elements, each of said distinct

3   watermarking elements having an array position and having one-to-one positional

)   correspondence with said image pixels, and

)   multiplying said brightness data associated with said at least one color component by a

1   predetermined brightness multiplying factor, wherein said brightness multiplying factor is a

2   corresponding distinct watermarking element, and said watermark has a invisibility

3   classification.

4   46. (Previously presented) A computer program product comprising a computer usable medium

5   having computer readable program code means embodied therein for causing a watermark to be

5   imparted into an image, the computer readable program code means in said computer program

Serial No.: 09/931,210

YOR919960153US4   16/37

1   product comprising computer readable program code means for causing a computer to effect the

2   steps of:

3   providing said digitized image comprised of a plurality of pixels, wherein each of said pixels

4   includes brightness data that represents a brightness of at least one color; and

5   altering said brightness data associated with a plurality of said pixels maintaining the hue and

6   saturation of said pixel.

7   47. (canceled)

8   48. (Previously presented) A computer program product comprising a computer usable medium

9   having computer readable program code means embodied therein for causing generation of a

10   watermarked image, the computer readable program code means in said computer program product

11   comprising computer readable program code means for causing a computer to effect the steps of:

2   imparting a watermark onto a digitized image having a plurality of original pixels, each of

3   said pixels having at least one original pixel brightness value;

4   providing said digitized watermarking plane comprising a plurality of watermarking

5   elements, each element having a watermark brightness multiplying factor and having

6   one-to-one positional correspondence with said original pixels; and

7   producing a watermarked image by multiplying said original brightness of each of

8   said original pixels by said brightness multiplying factor of a corresponding one of

9   said watermark elements.

10   49. (Previously presented) A computer program product comprising a computer usable medium

11   having computer readable program code means embodied therein for causing formation of a

12   watermarking plane, the computer readable program code means in said computer program product

13   comprising computer readable program code means for causing a computer to effect the steps of:

Serial No.: 09/931,210

YOR919960153US4   17/37

1   forming a watermarking plane including a plurality of elements each having a brightness adding or
2   subtracting factor, including the steps of:

3   generating a secure random sequence of integers having a first plurality of bits;

4   linearly remapping said random sequence to form a remapped sequence of brightness
5   multiplying factors to provide a desired modulation strength;

6   computing a discrete Fourier transform of said remapped sequence to form a Fourier
7   sequence having frequency coordinates;

8   expanding said frequency coordinates to form an expanded sequence;

9   computing an inverse discrete Fourier transform of said expanded sequence to obtain
0   a watermarking sequence of values; and

1   deriving said brightness adding or subtracting values of said elements of said
2   watermarking plane based upon said watermarking sequence of values.

3   50. (Previously presented) An article of manufacture comprising a computer usable medium having
4   computer readable program code means embodied therein for causing detection of a watermark in a
5   marked image, the computer readable program code means in said article of manufacture comprising
6   computer readable program code means for causing a computer to effect the steps of:

7   providing said marked image marked by a watermarking plane, said marked image having at
8   least one color plane including a plurality of image pixels, said watermarking plane having a
9   plurality of watermarking elements, wherein each of said image pixels has at least one
0   brightness value and each of said watermarking elements has a brightness adding and/or
1   subtracting factor, including the steps of:

Serial No.: 09/931,210

1   (a) reconstructing said watermarking plane;

2   (b) aligning said watermarking plane with said marked image such that each

3   watermarking element has a corresponding image pixel;

4   (c) providing a selector array and a visualizer image of equal size, wherein said

5   selector array has a plurality of selector elements each having at least one counter, and

6   wherein said visualizer image has a plurality of visualizer pixels each having at least

7   one brightness value, and wherein said visualizer pixels represent a recognizable

8   pattern when displayed;

9   (d) resetting said at least one counter to zero;

10   (e) placing said selector in an initial position by aligning said selector elements with a

11   plurality of corresponding image pixels and a plurality of corresponding

12   watermarking elements;

13   (f) choosing a selector element and identifying a corresponding watermarking

14   element;

15   (g) identifying a first plurality of watermarking elements that neighbor said

16   corresponding watermarking element;

17   (h) generating a first average that represents an average of brightness multiplying

18   factors of said first plurality of watermarking elements;

19   (i) choosing a color plane of said marked image and finding a corresponding image

20   pixel;

1   (j) identifying a first plurality of neighboring pixels that neighbor said corresponding

2   image pixel;

Serial No.: 09/931,210

YOR919960153US4   19/37

(k) generating a second average that represents an average of brightness values of said
first plurality of neighboring pixels;

(l) updating said at least one counter based upon first and second comparison
operations, wherein said first comparison operation compares said first average with
said brightness multiplying factor of said corresponding watermarking element and
said second comparison operation compares said second average with said brightness
value of said corresponding pixel;

(m) repeating steps (i) through (l) for all color planes;

(n) repeating steps (f) through (m) for all selector elements;

(o) choosing a new selector position that does not overlap any previous selector
position;

(p) repeating steps (f) through (o) for all non-overlapping selector positions; and

(q) generating a visual representation indicating detection of said watermark in said
marked image utilizing said at least one counter of said selector array and said
visualizer pixels.

51. (Original) An article of manufacture comprising a computer usable medium having computer
readable program code means embodied therein for causing detection of a watermark in a marked
image, the computer readable program code means in said article of manufacture comprising
computer readable program code means for causing a computer to effect the steps of claim 16.

52. (Original) An article of manufacture comprising a computer usable medium having computer
readable program code means embodied therein for causing generation of a visual representation of a
data array of data elements, the computer readable program code means in said article of

Serial No.: 09/931,210

1 manufacture comprising computer readable program code means for causing a computer to effect the

2 steps of claim 39.

3 53. (Original) An article of manufacture comprising a computer usable medium having computer

4 readable program code means embodied therein for causing a watermark to be imparted onto a

5 digitized image, the computer readable program code means in said article of manufacture

5 comprising computer readable program code means for causing a computer to effect the steps of

7 claim 18.

3 54. (Original) An article of manufacture comprising a computer usable medium having computer

9 readable program code means embodied therein for causing a watermark to be imparted onto a

10 digitized image, the computer readable program code means in said article of manufacture

11 comprising computer readable program code means for causing a computer to effect the steps of

12 claim 19.

13 55. (Original) An article of manufacture comprising a computer usable medium having computer

14 readable program code means embodied therein for causing detection of a watermark imparted onto

15 a digitized image, the computer readable program code means in said article of manufacture

16 comprising computer readable program code means for causing a computer to effect the steps of

17 claim 20.

18 56. (Original) An article of manufacture comprising a computer usable medium having computer

19 readable program code means embodied therein for causing detection of a watermark in a marked

20 image, the computer readable program code means in said article of manufacture comprising

21 computer readable program code means for causing a computer to effect the steps of claim 30.

22 57. (Previously presented) An article of manufacture comprising a computer usable medium having

23 computer readable program code means embodied therein for causing generation of a visual

24 representation of a data array of data elements, the computer readable program code means in said

25 article of manufacture comprising computer readable program code means for causing a computer to

26 effect the steps of claim 39.

Serial No.: 09/931,210

YOR919960153US4   21/37

1   58. (Original) An article of manufacture comprising a computer usable medium having computer

2   readable program code means embodied therein for causing demonstration of an existence of a

3   watermark in a marked image, the computer readable program code means in said article of

4   manufacture comprising computer readable program code means for causing a computer to effect the

5   steps of claim 43.

5   59. (Original) A computer program product comprising a computer usable medium having computer

7   readable program code means embodied therein for causing detection of a watermark in a marked

3   image, the computer readable program code means in said computer program product comprising

9   computer readable program code means for causing a computer to effect the steps of claim 44.

9   60.   (Original) An apparatus to impart a watermark onto a digitized image, said apparatus

1   comprising mechanisms for implementing the method of claim 1.

2   61.   (Original) An apparatus for imparting a watermark onto a digitized image comprising

3   mechanisms for implementing the method of claim 5.

4   62.   (Original) An apparatus for imparting a watermark onto a digitized image comprising

5   mechanisms for implementing the method of claim 6.

5   63.   (Canceled)

7   64. (Original) A method for detecting a watermark in a marked image, said method comprising:

3   providing said marked image having said watermark;

9   altering said marked image employing a blurring filter in producing a filtered image; and

9   employing a watermark detection method upon said filtered image to detect said watermark.

Serial No.: 09/931,210

YOR919960153US4   22/37

1   65. (Original) A method for detecting a watermark in a marked image, said method comprising:

2   providing said marked image having said watermark;

3   processing the marked image and producing a screened image;

4   altering said screened image employing a blurring filter in producing a filtered image; and

5   employing a watermark detection method upon said filtered image to detect said watermark.

5   66. (Original) A method as recited in claim 65, wherein the step of processing includes producing a
7   derivative image by screening, printing and scanning the marked image.

3   67. (Original) A method as recited in claim 15, wherein the step of aligning includes altering said
)   marked image employing a blurring filter.

)   68. (Currently amended) A method as recited in claim 16, wherein the image is a marked image, and
l   the step of aligning includes altering said marked image employing a blurring filter.

2   69. (Currently amended) A method as recited in claim 20, wherein the image is a marked image, and
3   the step of aligning includes altering said marked image employing a blurring filter.

4   70. (Currently amended) A method as recited in claim 30, wherein the image is a marked image, and
5   the step of providing includes altering said marked image employing a blurring filter.

5   71. (Currently amended) A method as recited in claim 44, wherein the image is a marked image, and
7   the step of aligning includes altering said marked image employing a blurring filter.

3   72. (Currently amended) An article of manufacture as recited in claim 51, wherein the image is a
)   marked image, and the step of aligning includes altering said marked image employing a blurring
)   filter.

Serial No.: 09/931,210

73. (Currently amended) An article of manufacture as recited in claim 59, wherein the image is a marked image, and the step of aligning includes altering said marked image employing a blurring filter.

74. (Currently amended) An apparatus as recited in claim 61, wherein the image is a marked image, and the ~~means of providing~~ mechanisms for implementing includes means for altering said marked image employing a blurring filter.

75. (Original) A method of generating a visual representation of a data array of data elements having a data array size, said method comprising:

providing a visualizer pattern of visualizer pixels represented by a visualizer array of visualizer elements, said visualizer array having a visualizer array size equal to said data array size, wherein each of said visualizer elements has a first logical value if a corresponding visualizer pixel is a first color and a complementary logical value if said corresponding visualizer pixel has a second color;

forming a data image of image pixels represented by an image array having an image array size equal to said data array size, wherein an image pixel has a corresponding data element and a corresponding visualizer pixel;

setting said data pixel to a color of said corresponding visualizer pixel if a value of said data element is above a predetermined threshold and to another color if said value is below said predetermined threshold; and

displaying said data image to form said visual representation.

76. (Original) A method as recited in claim 75, wherein said data array represents data resulting from a watermark detection implementation.

77. (Original) A method as recited in claim 75, wherein said first color is black and said second color

Serial No.: 09/931,210

YOR919960153US4   24/37

1   is white.

2   78. (Original) A method as recited in claim 75, wherein said threshold is set at a fifty percent success
3   rate.

4   79. (Original) An article of manufacture comprising a computer usable medium having computer
5   readable program code means embodied therein for causing generation of a visual representation of a
6   data array of data elements, the computer readable program code means in said article of
7   manufacture comprising computer readable program code means for causing a computer to effect the
8   steps of claim 75.

9   80. (Original) A computer program product comprising a computer usable medium having computer
10   readable program code means embodied therein for causing generation of a visual representation of a
11   data array of data elements, the computer readable program code means in said computer program
12   product comprising computer readable program code means for causing a computer to effect the
13   steps of claim 75.

14   81. (Original) An apparatus for generating a watermarked image comprising mechanisms for
15   implementing the method of claim 13.

16   82. (Original) An apparatus comprising mechanisms for implementing the method of claim 14.

17   83. (Original) An apparatus for detecting a watermark in a marked image comprising mechanisms
18   for implementing the method of claim 15.

19   84. (Original) An apparatus for detecting a watermarking plane comprising mechanisms for
20   implementing the method of claim 16.

21   85. (Original) An apparatus for imparting a watermark onto a digitized image comprising
22   mechanisms for implementing the method of claim 19.

Serial No.: 09/931,210

YOR919960153US4   25/37

1   86. (Original) An apparatus for detecting a watermark comprising mechanisms for implementing the

2   method of claim 20.

3   87. (Original) An apparatus for detecting a watermark comprising mechanisms for implementing the

4   method of claim 30.

5   88. (Original) An apparatus for demonstrating an existence of a watermark in a marked image

6   comprising mechanisms for implementing the method of claim 43.

7   89. (Original) An apparatus for detecting a watermark comprising mechanisms for implementing the

8   method of claim 44.

9   90. (Original) A method for detecting a watermarking plane comprising the steps of:

0   providing an image having a plurality of image pixels, $u(i,j)$, with said image having I rows

1   and J columns, and a pixel in row i and column j having at least one component, marked by a

2   watermarking plane; said watermarking plane having a plurality of watermarking elements, $w(i,j)$,

3   with said watermarking plane having I rows and J columns, and an element in row i and column j

4   having a brightness multiplying factor;

5   aligning said watermarking plane with said image;

6   identifying a subset of said image elements; and

7   for each pixel, $u(i,j)$, of said subset of image pixels, employing a detection scheme in

8   determining a probability of watermark detection based on a property of uniform distribution of the

9   random brightness multiplying factors or the random brightness adding or subtracting factors.

Serial No.: 09/931,210